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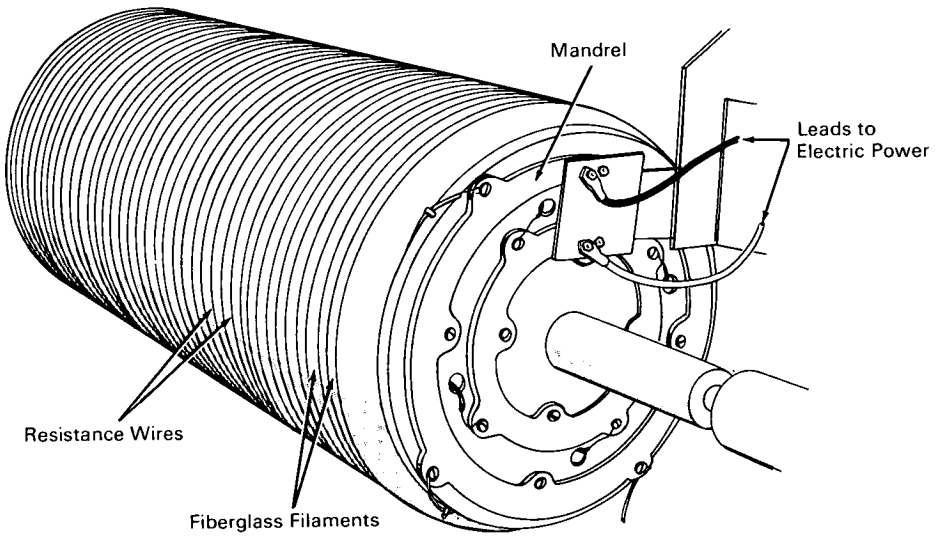
NASA TECH BRIEF

Fiberglass Parts Cured During Filament Winding Eliminates Oven, Saves Time



WINDING OF CYLINDRICAL PART

The problem: Parts such as rocket motor cases, launcher tubes, and pressure bottles made of fiberglass filaments impregnated with a thermosetting resin have had to be cured in ovens in order to set the delicate strands into a firm cohesive material. In the conventional procedure, the filaments after being wound to the required thickness on a mandrel conforming to the shape of the part are heated in a curing oven at a temperature ranging from 250° to 350°F. The separate curing cycle requires the use of a relatively expensive oven and slows down the production rate.

The solution: Use of a layer of resistance wire which is introduced midway during the filament winding operation and electrically heated while the remaining filaments are wound over the heated wire.

How it's done: One half of the desired final thickness of fiberglass filaments is wound under tension on the rotating mandrel in the conventional manner. The winding operation is then stopped and 0.002-inch resistance wire is introduced into the winding mechanism and wound under tension to provide a single layer of parallel strands about one-quarter inch apart over the fiberglass layer. A heat lamp is used to preheat the fiberglass filaments and resistance wire during this first stage of winding. The wire ends are then connected through a commutator and brush to a rheostat which controls the amount of power supplied from a 220-volt source. Winding of the fiberglass filaments is then continued, while the wire is emitting heat, until the second half of the filaments is added.

(continued overleaf)

The resin impregnating the total thickness of filaments is thus cured during the second half of the winding operation, and the part does not require any additional heat treatment after it is removed from the mandrel.

Notes:

1. The resistance wire, which remains embedded in the part, has no apparent deleterious effect on the mechanical properties of the filament-wound part.
2. Liquids stored in tanks made by this method could be heated to prescribed temperatures by applying electrical power to the ends of the resistance wire imbedded in the tank wall.
3. This procedure may be applicable if pressure treatment is required during the curing cycle.
4. Inquiries concerning this invention may be directed to:

   Technology Utilization Officer
   Marshall Space Flight Center
   Huntsville, Alabama, 35812
   Reference: B65-10088

Patent status: NASA encourages the immediate commercial use of this invention. It was invented by a NASA employee and a patent application has been filed. Inquiries concerning license rights may be made directly to the inventor, Mr. R. J. Carmody at Marshall Space Flight Center, Huntsville, Alabama, 35812.

Source: R. J. Carmody
(M-FS-14)